

# PATENT ABSTRACTS OF JAPAN

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(22)Date of filing : 17.03.1992 (72)Inventor : OKAWA TOKUO

## (54) PRODUCTION OF COPPER SULFATE SOLUTION

### (57)Abstract:

**PURPOSE:** To reduce the production cost by adding sulfuric acid to a metallic Cu powder suspension while introducing fine air bubbles and keeping the suspension at a specific temperature, oxidizing and dissolving the metallic Cu.

**CONSTITUTION:** An air self-sucking type dissolving vessel with a stirrer is charged with a prescribed amount of water and metallic Cu powder having 40-120 mesh particle size and the metallic powder is stirred and suspended. The temperature of the suspension is then regulated to 65-85° C and the number of revolutions of the stirrer is regulated to 100-125 r.p.m. A prescribed amount of 98% sulfuric acid is then slowly added by requiring much time while introducing a large amount of fine air bubbles. The stirring is subsequently continued for a prescribed time to oxidize and dissolve the metallic Cu powder at 99% conversion rate. Thereby, the objective CuSO<sub>4</sub> is safely obtained at a low cost.

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**DETAILED DESCRIPTION**

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**[Detailed Description of the Invention]**

[0001]

[Industrial Application] This invention relates to the method of manufacturing a copper sulfate solution simple from metallic copper powder.

[0002]

[Description of the Prior Art] Metallic copper powder is roasted, and the general method of manufacturing a copper sulfate solution from metallic copper powder considers it as copper oxide powder, and dissolves this in sulfuric acid. It is for this to require the oxidizing power by heat concentrated sulfuric acid for dissolving metallic copper with sulfuric acid directly, and for expense to start safe upper equipment too much, for performing this lytic reaction on a large scale.

[0003] Although a rotary kiln etc. can be used for manufacture of copper oxide powder, The equipment which dissolves the copper oxide powder obtained by it taking about 5 hours to process 500 kg of metallic copper powder is also independently required of the roast temperature of about 600 \*\*, and although total cost is low compared with a heat concentrated-sulfuric-acid dissolution method, there are many technical problems, such as saving of fuel cost and shortening of roast time.

[0004]

[Problem(s) to be Solved by the Invention] In light of the above-mentioned circumstances, this invention is a thing.

Without going, the purpose is low cost safely about a copper sulfate solution directly from metallic copper powder, and is providing the method of moreover manufacturing in a short time.

[0005]

[Means for Solving the Problem] Sulfuric acid is added maintaining this liquid at 65 thru/or 85 \*\*, while a method of this invention introduces a bubble of detailed air into

suspension of metallic copper powder so much, in order to attain the above-mentioned purpose, and the feature is that it carries out oxidizing melting of the metallic copper.

[0006]

[Function] 40 thru/or 120 meshes are suitable for the particle size of metallic copper powder. A dissolution rate becomes quick so that a particle size is small, but will deal with it, if a particle size is not much small, and are easy to become dust in inside, and work environment is got worse, and also it is hard to make suspension.

[0007] In order to introduce the bubble of detailed air so much, the dissolver provided with the agitator which takes in air at a self-priming ceremony from the air-intake in the upper part of an agitator, and is discharged [ be / it / under / of a shaft / passing ] from the tip of wings is suitable. Detailed air foam works to oxidation of metallic copper powder very effectively, and completes oxidizing melting comparatively for a short time.

[0008] The bubble of air becomes small, and oxidation efficiency becomes good so that the diameter of an air exhaust port is small, but since there is also a possibility of blockading with the garbage in the air, etc. when not much small, it is practical to be referred to as 5 thru/or about 10 mm.

[0009] After the inversion rate from metallic copper to copper sulfate reaches to 99%, it is useless to raise number of rotations more, and what is necessary is for a bubble to become detailed and for dissolution efficiency to rise so that the number of rotations of an impeller is large, but just to ask for the optimal number of rotations experimentally. According to the experiment, 100 thru/or 125r.p.m. can also call it suitable number of rotations.

[0010] For said inversion rate, solution temperature is also important and he is high Aritoshi Tei. However, since the corrosion of the environmental deterioration by evaporation of liquid and a device is caused, it is a range with suitable 65 thru/or 85 \*\* undesirably to raise temperature not much.

[0011] It is good to be better than performing addition of sulfuric acid at once to add according to oxidation reaction, and to add requirements gradually over about 1 hour.

[0012] If metallic-copper-powder suspension is processed by such a method, a copper sulfate solution can be obtained with not less than 99% of an inversion rate in about 3 hours, and, also in energy and in time, it is more advantageous than a conventional method.

[0013]

[Example]

The industrial water 920l is put into the dissolving device which has a tub with a jacket of experiment No.1--1.5-m<sup>3</sup> capacity, and an air self-priming type agitator, After investing 125 kg of metallic copper powder whose particle size is 40 thru/or 60 meshes and making it suspended, the number of rotations of the agitator was made into 125r.p.m., and 225 kg of concentrated sulfuric acid was added over about 1 hour 98%.

Solution temperature was maintained at 70 \*\* in the meantime, and churning was continued for further 2 hours. The inversion rate to copper sulfate was 99.2%.

[0014]Experiment No.2 -- to the device of capacity <sup>3</sup> of 12 m which enlarged the dissolving device of experiment No.1. Solution 10m<sup>3</sup> containing 18 g/l of arsenic, 30 g/l of copper, and 90 g/l of sulfuric acid is put in, Invest in this 500 kg of metallic copper powder whose particle size is 80 thru/or 120 meshes, it was made suspended to it, the agitating speed was made into 100r.p.m., 287 kg of concentrated sulfuric acid was added 98% in about 2 hours, and churning was continued for further 1 hour, maintaining solution temperature among 75 thru/or 80 \*\* in the meantime. The inversion rate to copper sulfate of metallic copper powder was 99.0%.

[0015]

[Effect of the Invention]Moreover, a copper sulfate solution can be directly manufactured now by safety and low cost from metallic copper powder by this invention in a short time.

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**CLAIMS**

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**[Claim(s)]**

[Claim 1]A manufacturing method of a copper sulfate solution adding sulfuric acid, maintaining this liquid at 65 thru/or 85 \*\* introducing a bubble of detailed air into metallic-copper-powder suspension so much, and carrying out oxidizing melting of the metallic copper.

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(54)【発明の名称】硫酸銅溶液の製造方法

(57)【要約】

【目的】 金属銅粉から直接硫酸銅溶液を安全に低成本で、しかも短時間に製造し得る方法を提供する。

【構成】 金属銅粉懸濁液に微細な空気の泡を多量に導入しながら該液を6.5乃至8.5℃に維持しつつ硫酸を添加し、金属銅を酸化溶解する。

## 【特許請求の範囲】

【請求項1】 金属銅粉懸濁液に微細な空気の泡を多量に導入しながら該液を65乃至85°Cに維持しつつ硫酸を添加し、金属銅を酸化溶解することを特徴とする硫酸銅溶液の製造方法。

## 【発明の詳細な説明】

【0001】

【産業上の利用分野】 本発明は金属銅粉から硫酸銅溶液を簡便に製造する方法に関するものである。

【0002】

【従来の技術】 金属銅粉から硫酸銅溶液を製造する一般的な方法は、金属銅粉を焙焼して酸化銅粉とし、これを硫酸で溶解するというものである。これは金属銅を直接硫酸で溶解するには熱濃硫酸による酸化力を要し、この溶解反応を大規模に行うには安全上設備に費用がかかり過ぎるためである。

【0003】 酸化銅粉の製造には例えばロータリーキルンなどが使用できるが、600°C程度の焙焼温度で金属銅粉500kgを処理するのに5時間かかり、得られた酸化銅粉を溶解する設備も別に必要であり、熱濃硫酸溶解方式に比べてトータルコストは低いと言え、燃料代の節約、焙焼時間の短縮等課題が多い。

【0004】

【発明が解決しようとする課題】 本発明は上記事情に鑑みて為されたものであり、酸化銅粉を経由することなく、金属銅粉から直接硫酸銅溶液を安全に低成本で、しかも短時間に製造し得る方法を提供するものである。

【0005】

【課題を解決するための手段】 上記目的を達成するため本発明の方法は、金属銅粉の懸濁液に微細な空気の泡を多量に導入しながら該液を65乃至85°Cに維持しつつ硫酸を添加し、金属銅を酸化溶解する点に特徴がある。

【0006】

【作用】 金属銅粉の粒度は40乃至120メッシュが適当である。粒度が小さい程溶解速度は速くなるが、あまり粒度が小さいと取り扱い中に粉塵になり易く、作業環境を悪化する上、懸濁液を作りにくい。

【0007】 微細な空気の泡を多量に導入するには、攪拌機の上部にある空気取入口から空気を自吸式に取入れ、シャフトの中を通って翼の先端から排出する攪拌機を備えた溶解槽が適当である。微細な空気泡が金属銅粉の酸化に極めて効果的に働き、比較的短時間で酸化溶解を完了する。

【0008】 空気排出口の直径は小さい程空気の泡は小

さくなり、酸化効率は良くなるが、あまり小さないと空気中のゴミ等で閉塞する恐れもあるので、5乃至10mm程度とするのが実際的である。

【0009】 又、攪拌翼の回転数は大きい程泡は微細になり溶解効率は上昇するが、金属銅から硫酸銅への転化率が99%に達した後はそれ以上回転数を上げることは無駄であり、最適の回転数を実験的に求めれば良い。実験によると、100乃至125r.p.m.が適当な回転数とも言える。

【0010】 前記転化率にとって液温も重要であり、高い程有利である。しかしながら温度をあまり上げることは液の蒸発による環境悪化、装置の腐食を招くので好ましくなく、65乃至85°Cが適当な範囲である。

【0011】 硫酸の添加は一度に行うよりも酸化反応に従って添加するのがよく、所要量を1時間程度掛けて徐々に添加すると良い。

【0012】 このような方法で金属銅粉懸濁液を処理するとほぼ3時間で転化率99%以上で硫酸銅溶液を得ることができ、エネルギー的にも、時間的にも従来法より有利である。

【0013】

## 【実施例】

実験No.1…1.5m<sup>3</sup>容量のジャケット付槽と空気自吸式攪拌機を有する溶解装置に工業用水920lを入れ、粒度が40乃至60メッシュの金属銅粉125kgを投入して懸濁させた後、攪拌機の回転数を125r.p.m.とし、98%濃硫酸225kgを約1時間かけて添加した。この間液温を70°Cに維持し、攪拌を更に2時間続けた。硫酸銅への転化率は99.2%であった。

【0014】 実験No.2…実験No.1の溶解装置を大型化した容積12m<sup>3</sup>の装置に、砒素18g/1、銅30g/1、硫酸90g/1を含有する溶液10m<sup>3</sup>を入れ、これに粒度が80乃至120メッシュの金属銅粉500kgを投入して懸濁させ、攪拌速度を100r.p.m.とし、98%濃硫酸287kgを約2時間で添加し、この間液温を75乃至80°Cの間に維持しながら更に1時間攪拌を続けた。金属銅粉の硫酸銅への転化率は99.0%であった。

【0015】

【発明の効果】 本発明により金属銅粉から硫酸銅溶液を直接、安全かつ低成本でしかも短時間で製造できるようになった。